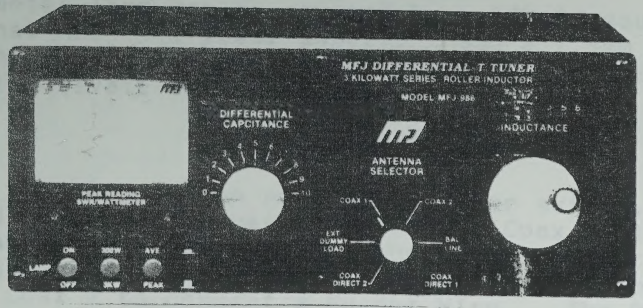
MFJ DIFFERENTIAL-T ANTENNA TUNER

MODEL MFJ-986



OWNER'S MANUAL

CAUTION: Read All Instructions Before Operating Equipment.

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MFJ-986 Differential-T Tuner Instructions

The MFJ-986 Differential-T 3KW Tuner uses a differential capacitor to make tuning easy. It covers 1.8-30 MHz continuously, including MARS and all the WARC bands. The roller inductor lets you tune down your SWR to the absolute minimum. The MFJ-986 also features a peak reading cross-needle SWR/Wattmeter and a new current balun. **MFJ Enterprises, Inc. wants to thank Boyce A. Taylor, W5GZM, for sharing his idea for using a differential capacitor in a T-Network tuner.**

Peak Reading SWR/Wattmeter

The cross-needle meter lets you simultaneously read peak or average Forward power, Reflected power and SWR in two ranges. To read FORWARD POWER, set the power range switch to HI (2000 watts) or LO (200 watts). Next read the power level on the FOWARD SCALE. REFLECTED POWER is shown at the same time on the REFLECTED POWER SCALE. SWR is read by observing where the two needles cross. No SWR sensitivity adjustment is needed to read SWR. You get a peak holding reading when you set the METER button to PEAK. Read the power level off of both scales.

The HI range is 2KW forward and 500W reflected. The LO range is 200W forward and 50W reflected.

The meter lamp can be powered by a 12V DC source, such as the optional MFJ-1312 power supply. Use a 2.5mm plug with the tip of the plug connected to the positive. METER LAMP ON/OFF switch will activate the meter lamp.

ANTENNA SWITCH

This is a 6 position antenna selector switch. Coax 1 or Coax 2 feed antennas through the tuner. Coax 1 Direct or Coax 2 Direct bypasses the tuner but not the meter circuit. You can also select a Balanced Line antenna or an External Dummy Load. Use Coax 1 or Coax 2 to connect a Random Wire. The External Dummy Load position lets you connect a dummy load, like the MFJ-250 Oil-filled VERSALOAD or the MFJ-262 DRY LOAD for tuning.

CURRENT BALUN

The MFJ-986 uses a CURRENT balun to force equal currents into the two antenna halves so you get minimum unbalanced currents. Minimum unbalanced current reduces field pattern distortion which concentrates your power for a stronger signal.

INSTALLATION

1. Locate the tuner so the rear is not accessible during operation. If balanced line operation is used, the ceramic feed-thru insulators will have high RF voltages which can cause serious RF burns if touched while transmitting. Locate the tuner in a convenient location in the operating position.

2. Install the tuner between the transceiver and the antenna(s) as shown in the diagram. Use coax cable such as RG-8/u to connect the transmitter to the connector marked **TRANSMITTER** on the back of the MFJ-986. This coax cable should be as short as possible. If you are using a linear amplifier, then connect the output of the transceiver to the input of the amplifier and the output of the amplifier to the MFJ-986.

3. Connect your antenna(s) to the tuner as follows:

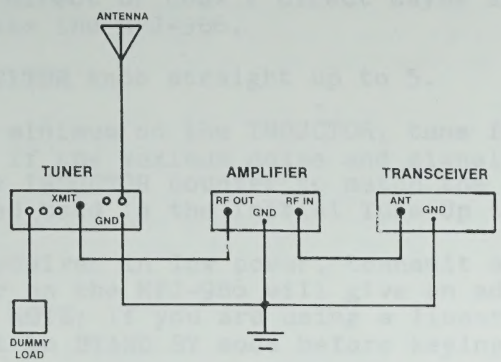
   A. Connect coax cable feed lines from your antenna(s) to **COAX 1 and/or Coax 2**. Coax lines may be fed direct or through the tuner as selected by the **ANTENNA SELECTOR** switch.

   B. A balanced line antenna may be connected to the two ceramic feed-thru terminals labeled **BAL. LINE** on the back of the MFJ-986.

   C. A random wire or a single line antenna must be connected to either **Coax 1** or **Coax 2** using a banana plug or a PL-259 male connector. Use the center pin only of the PL-259. Do **NOT** connect the wire to the shield, since it will ground your random wire to your tuner.

   D. Use the **GROUND** post to ground the tuner to the transceiver, amplifier, and earth ground.

   E. A dummy load could be connected to the **EXTERNAL DUMMY LOAD** connector. This will give you the convenience of not having to connect or disconnect your dummy load from the MFJ-986 every time you tune your radio. Use coax cable such as RG-8/u.



CONNECTION DIAGRAM

OPERATION

The roller inductor has a minimum inductance when the knob is rotated fully clockwise. When rotated fully counter-clockwise, it has maximum inductance.

First, rotate the knob fully clockwise. Then, use a small screwdriver or a pencil and push the reset lever through the hole beside the counter. The counter should reset to "000". Turning the knob counter-clockwise will increase the numbers and the inductance of the MFJ-986.

TRANSMITTER SETTING:

1. Set your transmitter to the desired band and frequency of operation.

2. Set the power output to low power. (Use the TUNE position of your transceiver if it has one.)

3. If you are using a linear amplifier, set it to the Stand-by mode. **Do not key into the amplifier until the MFJ-986 is properly tuned.**

4. Connect your dummy load to the **External Dummy Load** connector on the rear of the MFJ-986. **CAUTION:** If your radio has a tube finals, tune it into a dummy load at low power. Use the TUNE position on your radio if it has one.

MFJ-986 TUNING

1. Set the **AVG/PEAK** switch to **AVG**.

2. Set the **HI/LO** switch to **LO**.

3. Set the **Antenna Switch** to the position that your antenna is connected to. If you intend to use the MFJ-986 to tune your antenna, then you must select either **Coax 1**, **Coax 2**, or **Bal. Line**. **Coax 1 Direct** or **Coax 2 Direct** maybe selected if you desire to bypass the MFJ-986.

4. Turn the **CAPACITOR** knob straight up to 5.

5. Starting from minimum on the **INDUCTOR**, tune for maximum noise and signals. If the maximum noise and signal setting is not found, set the **INDUCTOR** counter to match the setting listed for the desired band in the Initial Tune-Up table on page 4.

6. With the transceiver in low power, transmit adequate power so that the meter on the MFJ-986 will give an adequate reading while tuning. **NOTE:** If you are using a linear amplifier, be sure to set it to STAND BY mode before keying the transceiver.

7. Rotate the **INDUCTOR** knob until there is a dip in the **Reflected Power** and an increase in **Forward Power**.

8. Now turn the **Capacitor** knob left or right until you get a decrease in **Reflected Power** and an increase in **Forward Power**. Next rotate the **Inductor** knob to find the minimum **Reflected Power** and the maximum **Forward Power** for this **Capacitor** setting.

9. Repeat step 8 until the minimum Reflected Power and maximum Forward Power is achieved. Make sure your SWR is below 2:1.

10. After the MFJ-986 is optimumly tuned, you can set the HI/LO switch to HI.

11. If you are using a linear amplifier, set it to the desired operating band and then tune your amplifier according to its owner's manual.

12. Once the amplifier is tuned, you are ready to transmit.

OPERATING NOTES

For some antennas using high power, especially on 160 meters, arcing may occur in the variable capacitor. If this happens, reduce your power until arcing stops.

The MFJ-986 is designed to have a wide matching range, but all tuners are limited in their matching ability. For some antennas you may not be able to achieve a 1:1 SWR. An SWR of 1.5:1 to 2:1 is usually acceptable to most transmitters (see your transmitter instructions).

If you cannot get your SWR to an acceptable level, try lengthening or shorting your antenna and/or feedline.

Use the least amount (lowest Inductor Counter number) of Inductance necessary when tuning for minimum SWR. If the Inductor Counter slips out of calibration, rotate the Inductor Knob clockwise as many turns as necessary until the end of the Inductor is reached. Insert a small screwdriver into counter reset hole and push. The counter will reset to "000".

If you get low SWR at more than one control setting, use the setting which gives the maximum Forward and minimum Reflected power levels and uses th minimum Inductance i. e. the lowest counter number.

The following table can be used as a guide to tune your MFJ-986 to a specific operating band. When the MFJ-986 is properly tuned, the counter reading should approximately match the number on the table. If the counter is too far from the number on the table, then the tuner is not properly tuned. If this is the case, return to Step 7 of the MFJ-986 TUNING section and repeat the tuning process.

BAND	INDUCTOR
160 M	117
80 M	46
40 M	16
20 M	6
15 M	3
10 M	1

INITIAL TUNE-UP INDUCTOR SETTINGS

WARNING

1. Never operate the tuner with the top removed. The voltages inside are very dangerous during operation.

2. Never rotate the ANTENNA SELECTOR switch while transmitting because damage to the switch may result.

3. Locate the tuner so that it will not be accessible from the rear. Never touch the rear of the unit during operation.

4. Disconnect the antenna(s) from the tuner during lightning and thunderstorms.

5. Always tune with low power (less than 100 watts). Apply maximum power only after tuning up.

6. Do not key transmitter into high SWR for a long period of time.

WARNING

1. Never operate the tuner with the box removed. The voltages inside are very dangerous during operation.

2. Never rotate the ANTENNA SELECTOR switch while transmitting because damage to the switch may result.

3. Locate the tuner so that it will not be accessible from the rear. Never touch the rear of the unit during operation.

4. Disconnect the antenna(s) from the tuner during lightning and thunderstorms.

5. Always tune with low power (never than 100 watts). Apply maximum power only after tuning up.

6. Do not key transmitter into <u>high</u> SWR for a long period of time.

FULL 12 MONTH WARRANTY

MFJ Enterprises, Inc. warrants to the original owner of this product, if manufactured by MFJ Enterprises, Inc. and purchased from an authorized dealer or directly from MFJ Enterprises, Inc. to be free from defects in material and workmanship for a period of 12 months from date of purchase provided the following terms of this warranty are satisfied.

1. The purchaser must retain the dated proof-of-purchase (bill of sale, canceled check, credit card or money order receipt, etc.) describing the product to establish the validity of the warranty claim and submit the original of machine reproduction of such proof of purchase to MFJ Enterprises, Inc. at the time of warranty service. MFJ Enterprises, Inc. shall have the discretion to deny warranty without dated proof-of-purchase. Any evidence of alteration, erasure, of forgery shall be cause to void any and all warranty terms immediately.

2. MFJ Enterprises, Inc. agrees to repair or replace at MFJ's option without charge to the original owner any defective product provided the product is returned postage prepaid to MFJ Enterprises, Inc. with a personal check, cashiers check, or money order for **$7.00** covering postage and handling.

3. MFJ Enterprises, Inc. will supply replacement charges free of charge for any MFJ product under warranty upon request. A dated proof of purchase and a **$5.00** personal check, cashiers check, or money order must be provided to cover postage and handling.

4. This warranty is **NOT** void for owners who attempt to repair defective units. Technical consultation is available by calling (601) 323-5969.

5. This warranty does not apply to kits sold by or manufactured by MFJ Enterprises, Inc.

6. Wired and tested PC board products are covered by this warranty provided **only the wired and tested PC board product is returned.** Wired and tested PC boards installed in the owner's cabinet or connected to switches, jacks, or cables, etc. sent to MFJ Enterprises, Inc. will be returned at the owner's expense unrepaired.

7. Under no circumstances is MFJ Enterprises, Inc. liable for consequential damages to person or property by the use of any MFJ products.

8. **Out-of-Warranty Service:** MFJ Enterprises, Inc. will repair any out-of-warranty product provided the unit is shipped prepaid. All charges will be shipped COD to the owner.

9. This warranty is given in lieu of any other warranty expressed or implied.

10. MFJ Enterprises, Inc. reserves the right to make changes or improvements in design or manufacture without incurring any obligation to install such changes upon any of the products previously manufactured.

11. All MFJ products to be serviced in-warranty or out-of-warranty should be addressed to **MFJ Enterprises, Inc., 921A Louisville Road, Starkville, Mississippi 39759, USA** and must be accompanied by a letter describing the problem in detail along with a copy of your dated proof-of-purchase.

12. This warranty gives you specific rights, and you may also have other rights which vary from state to state.